

ABSTRACT

Materials, compounds and compositions for radiation patternable functional thin films, methods of synthesizing such materials and compounds, and methods for forming an electronically functional thin film and structures including such a film. The compounds and compositions generally include (a) nanoparticles of an electronically functional material or substance and (b) ligands containing a (photo)reactive group. The method generally includes the steps of (1) irradiating the compound and/or composition, and (2) curing the irradiated compound and/or composition, generally to form an electronically functional film. The functional thin film includes a sintered mixture of nanoparticles. The thin film exhibits improved morphology and/or resolution relative to an otherwise identical structure made by an identical process, but without the (photo)functional group on the ligand, and/or relative to an otherwise identical material patterned by a conventional graphics art-based printing process. The present process also exhibits improved throughput relative to conventional photolithographic processing, by eliminating a metal deposition step. The present invention advantageously provides functional thin film structures having qualities suitable for use in electronics applications, such as display devices or RF ID tags, while enabling elimination of a number of conventional photolithographic processing steps (e.g., functional material sputtering, PECVD, etc.).